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Facts about SCREWWORM ERADICATION

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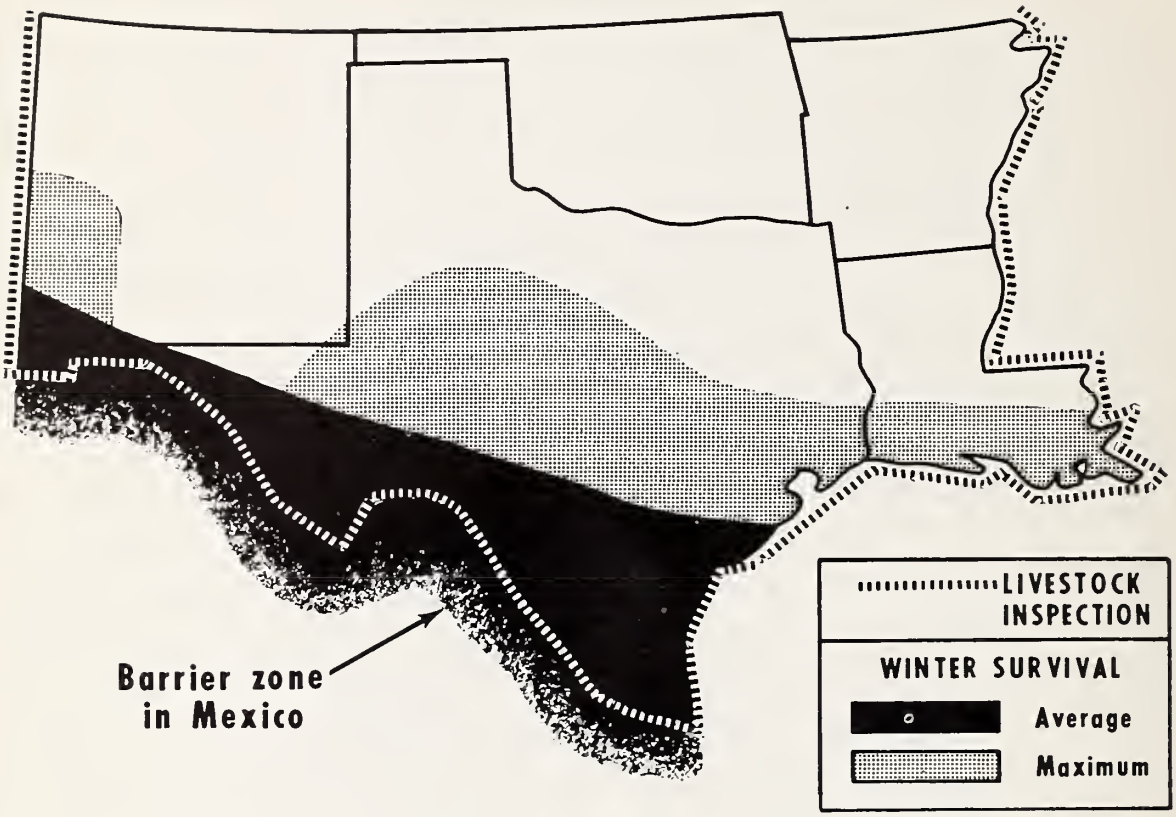
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

SCREWWORM

Eradication Area



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The 5-State screwworm eradication area contains a large region where the insect may survive the winter. Basic procedures in the eradication program include ridding Texas and New Mexico of overwintering screwworms, and inspection and treatment of animals entering the eradication area to prevent intraduction and spread of the pest.

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Cover photo: These converted aircraft buildings on the former Moore Air Base near Mission, Tex., house the sterile screwworm productian plant that is the heart of the Southwest screwworm eradication program. Aircraft in the foregraund distribute flies reared at the plant.

FACTS ABOUT

SCREWWORM ERADICATION

The screwworm, a cause of animal suffering and serious livestock losses for more than 125 years, is the object of an intensive eradication campaign begun in the Southwest in 1962. Present annual livestock losses in the Southwest are estimated to range from 25 to 100 million dollars. Wildlife losses are also known to be great, but no estimates of total losses are available.

As screwworms spread each spring and summer from the warmer regions of the Southwest, they become serious pests as far north as Colorado and Nebraska, and as far east as Louisiana and Arkansas. The insect enters many States in shipments of screwworm-infested livestock and may spread by natural flight at the rate of 35 miles per week.

Fortunately, cold weather cuts short screwworm invasions of northern sections of the country by killing the insect. Screwworms continue to be an annual threat to the Southeast, however, where there are subtropical areas in which the pest can survive the winter and become firmly established. The Southeast was infested with screwworms until 1959, when a successful eradication program destroyed the overwintering population of the insect.

Survey of the Screwworm Problem

A survey of the screwworm problem in the Southwestern United States and Northeastern Mexico was made in 1959 by the United States Department of Agriculture in cooperation with State livestock officials of the Southwest and representatives of the Republic of Mexico.

Several features about the southwestern screwworm problem were not encountered during the screwworm eradication campaign in the Southeast. For example, cold weather usually confined the overwintering screwworm population in the Southeast to the southern half of Florida. Once destroyed, this population could be re-established by land routes only from the Southwest. There are, however, no known natural barriers, such as a large expanse of water, or a high mountain range, that prevent screwworms from moving freely throughout Northern Mexico and the Southwestern United States. So, it is necessary to develop and establish an artificial barrier that would prevent reinfestation of southwestern areas freed of screwworms.

The screwworm overwintering area in Texas and New Mexico--where all screwworms would have to be eradicated--is larger than it was in the Southeast. The terrain, climate, and vegetation of the two sections of the United States also differ vastly.

In spite of these and other unique features of the screwworm problem in the Southwest, information from the 1959 survey and from other sources indicated that it is possible to eliminate screwworms from the area using the eradication techniques employed in the successful southeastern screwworm eradication campaign.

The Eradication Method

The screwworm eradication method developed through research and proved fundamentally sound by successful application in the Southeast involves the following procedures:

- Release of millions of sexually sterile screwworm flies.
- Control of animal shipments, along with inspection and treatment of animals, to prevent introduction and spread of screwworms.
- Intensive use by livestock producers of measures for preventing and treating screwworm cases, including regular inspection of animals, regular use of preventive sprays, and use of approved smears for wound treatment.
- Detecting and reporting by livestock and pet owners of all suspected screwworm cases to provide extensive daily information about the incidence and abundance of the pest.
- Wide circulation of information to keep livestock producers and others informed of the progress of the program and of measures they can take to strengthen it.

The release of millions of man-reared, sexually sterile screwworm flies literally destroys the reproductive potential of naturally occurring screwworms. The sterile male flies search out and mate with natural or native female flies. These females mate just one time. After mating with a sterile male, the eggs produced will not hatch. If release of sterile flies continues long enough and in sufficient numbers, the possibilities for native screwworms to have fertile matings become more remote, and eventually the insect is eradicated.

Eradication Program Authorized

In response to strong interest on the part of livestock producers and others, the Secretary of Agriculture on February 13, 1962, announced the beginning of a cooperative program to eradicate screwworms from large areas of the Southwest. The program was established as a joint effort of the Agricultural Research Service, United States Department of Agriculture, and many public and private groups and organizations in Texas, New Mexico, Oklahoma, Arkansas, and Louisiana. These include the Southwest Animal Health Research Foundation, the Texas Animal Health Commission, and other State livestock regulatory agencies, organized livestock groups, Agricultural Extension Services, Vocational Agriculture Organizations, and many others.

A Supplemental Budget Estimate was forwarded to Congress on February 7, 1962, requesting the appropriation of $3 million to provide the Federal share of program costs through June 30, 1963. The Second Supplemental Appropriation Act of 1962, approved on July 25, 1962, provided $2.75 million for costs during fiscal year 1963. The appropriation act contained a provision relating to the use of Federal funds in the cooperative program as follows: "Provided, that the foregoing amount shall not be available for conduct of any screwworm eradication program that does not require minimum matching by State or local sources of at least 50 per centum of the expenses of production, irradiation, and release of the screwworm flies."

The program objectives are to eradicate screwworms from Texas, New Mexico, Oklahoma, Arkansas, and Louisiana, and to establish measures that will prevent reinfestation by the pest.

Three basic steps for accomplishing the objectives are:

(1) To rid Texas and portions of New Mexico of overwintering screwworms which spread during warm weather to infest these and other States.

(2) To determine the requirements for an effective artificial barrier against reinfestation of areas freed of screwworms.

(3) To establish and operate the artificial barrier.

Estimated cost of the program for 3 years is $12 million, provided by Federal, State, and local funds.

Production of Sterile Screwworm Flies

During the first 5 months of the eradication program temporary facilities at Kerrville, Tex., were used to rear sterile screwworm flies. Production there eventually reached more than 20 million flies per week.

Thousands of screwworms feed on a mixture of ground meat, beef blood, and water heated to a temperature of 90° F. When larvae crawl from feeding vats, searching for a place to change to pupae, funnels on side of vats direct them into water-conveying troughs in floor under grate.

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Cartons of sterile flies are loaded on a plane to be systematically dispersed over screwworm-infested areas. A special device on the underside of the aircraft opens the cartons as they are released from the plane at predetermined intervals.

In mid-June 1962, a permanent plant for rearing, sterilizing, and packaging sterile screwworm flies was completed near Mission, Tex., on the former Moore Air Base. The Mission facility is headquarters for the eradication program. It includes a Survey Data Center, where specimens of eggs and larvae collected by livestock producers are positively identified and recorded to help provide a current picture of infestation. Entomology research and methods development laboratories also are part of the facility.

Although it is similar to the sterile fly plant constructed at Sebring, Fla., in 1958, the new fly-rearing plant incorporates many refinements in equipment and production methods which increase plant efficiency. Average production of sterile flies is around 50 million per week, with a maximum production of more than 75 million per week. Half of all flies raised and sterilized are females.

The plant has over 75,000 square feet of floor space, and its operations require three work shifts, 24 hours a day, 7 days a week.

Screwworms are reared in shallow vats that contain ground lean meat, water, and blood, to which a small amount of preservative is added. This mixture is kept at 100° F., about the temperature in wounds of animals. As the maggots mature they crawl from the rearing vats and are collected and placed in trays containing sawdust where they enter the pupal (cocoon-like) stage of their life cycle. To produce 75 million flies weekly, the following approximate amounts of materials are required each week: Meat--40 tons; blood--4,000 to 5,000 gallons; water--13,000 gallons.

When the screwworm pupae are $5\frac{1}{2}$ days old, they are made sexually sterile by brief exposure to Cobalt-60, an atomic energy byproduct that emits gamma rays. Male and female flies that later emerge from the pupae are also sterile. They are not radioactive, however, and present no hazard to people, animals, or plants.

The pupae are packaged automatically in cardboard cartons in which the flies emerge.

Eradicating Overwintering Screwworms

The first sterile screwworm flies were released in February 1962, after unusually severe cold weather had greatly reduced the size of the area where screwworms could survive throughout the winter. These first releases of limited numbers of flies did not confine screwworms to the overwintering areas where they could be eradicated. It later was evident, however, that eradication efforts during winter, spring, and summer months of 1962 helped to restrict the numbers of the insect pest. Many livestock producers reported fewer screwworm cases than usually experienced during spring and summer. Invasions of screwworms that usually occur in mid-August in Louisiana and Arkansas failed to materialize. Although there were indications of relief from screwworm damage, cases were reported during 1962 throughout Texas and New Mexico, and in parts of Oklahoma.

When it became evident that screwworms could not be restricted to overwintering areas near the United States-Mexico border, eradication efforts were concentrated on reducing to a minimum the number of screwworms in areas of Texas and New Mexico where the insect could survive the winter of 1962-63. The size of this area fluctuates with winter climatic conditions, being larger during mild winters than during severe winters. Regular, systematic releases of sterile flies are made at rates of about an average of 800 per square mile over a 73,000-square-mile area in Texas, and a 7,000-square-mile area in New Mexico--weather permitting. Other fly releases are being made over an area along the U.S.-Mexico border in Mexico to develop the barrier zone to prevent reinfestation.

In addition to release of sterile flies over these large areas, flies are being released where necessary to control abnormal buildups of the insect, particularly along streams or in areas where vegetation, terrain, or other factors provide favorable conditions for native screwworms. From 10 to 20 light airplanes are used to systematically distribute cartons of sterile flies. They operate in established flight patterns and each airplane carries about 1,000 cartons. The cartons are opened and released from the planes at 2,000 to 5,000 feet altitude.

Plans for release of sterile flies will remain flexible throughout the program primarily because of the important, but unpredictable role played by weather. Results of the eradication program in 1963 will be affected greatly by the type of weather occurring during the winter of 1962-63. Because the overwintering area varies in size with the severity of winters, the area of fly release must be varied accordingly. Also, the possibility of screwworm outbreaks in the Southeastern United States as a result of shipments of infested livestock could require release of sterile flies east of the Mississippi River. Shipments of infested livestock also could cause premature spring outbreaks of screwworms in northern portions of the Southwestern States and require concentrated fly release for quick control.

The Barrier Zone

To study the effectiveness of an artificial barrier along the U.S.-Mexico border, sterile screwworm flies will be released in a zone that initially will average about 100 miles in width. The studies are being conducted in cooperation with the Mexican Government. The number of sterile flies released and the width and length of the fly-release zone are factors that must be determined as the barrier is developed.

Information received from the cooperating livestock producers through the submission of screwworm specimens found in their livestock will demonstrate the incidence of screwworm flies within a given area and will be the greatest factor in determining the number of sterile screwworm flies to be dropped and the length and width of the barrier.

Control over movement of livestock is an important factor in preventing reinfestation of areas freed of screwworms. Livestock shipments into the eradication area from other screwworm-infested areas of the U.S. and Mexico are regulated by Federal livestock inspection stations. They are patterned after inspection stations now operating in the Mississippi River Valley. At these stations, livestock entering fly-free areas of the eradication area are unloaded and checked for screwworms. Animals are sprayed with an approved insecticide and all wounds are treated before entry is permitted.

Mexican livestock entering the United States will continue to be thoroughly checked and treated for screwworms at border stations by USDA's Animal Inspection and Quarantine Division personnel and patrols operated by USDA will continue to check for animals straying back and forth across the border.

Livestock Producers Must Help

If the eradication program proceeds according to plan, livestock producers will likely experience considerable relief from screwworm infestations, beginning with the first year of operations. Eradication, however, is not achieved by sterile fly release, alone.

Livestock producers must do several things to assure success of the eradication program and to increase its efficiency. These include:

- Examine animals regularly for any scratch, cut or open wound.
- Manage livestock in a way that prevents injuries and avoids wounds from surgery, birth, or other causes, especially during warm weather when screwworms may be abundant.
- Collect maggots or egg masses that may be present in wounds, place them in alcohol or water, and give them to the county agent, livestock inspector, or veterinarian to be forwarded for positive identification.
- Treat wounds with EQ 335, smear 62, or smear containing ronnel.
- Apply approved preventive sprays, following directions provided on manufacturers' labels. Closely observe restrictions on animal movement.
- Make sure that purchased animals are free from screwworms when they are loaded at point of origin.
- Cooperate with neighbors--encourage them to follow precautions.

N-37905

Producers can help assure success of eradication measures by collecting maggots or eggs present in wounds, and sending them to the county agent, livestock inspector, or veterinarian for positive identification.

In addition to providing protection for his own livestock, the rancher or farmer who follows the above practices contributes to the eradication program in a number of ways. By keeping the number of natural screwworms to a minimum, fewer sterile files are needed over a shorter period to achieve eradication, thus the overall cost of the program can also be lowered.

By regularly collecting eggs and larvae from infested animals and forwarding them to authorities, livestock growers help to establish a more accurate pattern of screwworm infestations. This information is valuable in determining areas where special attention is needed and will become increasingly important to the success of the program as eradication progresses. Evaluation of the effects of sterile fly release is particularly vital when screwworm populations begin to decline and a decision must be made as to whether eradication has been achieved.

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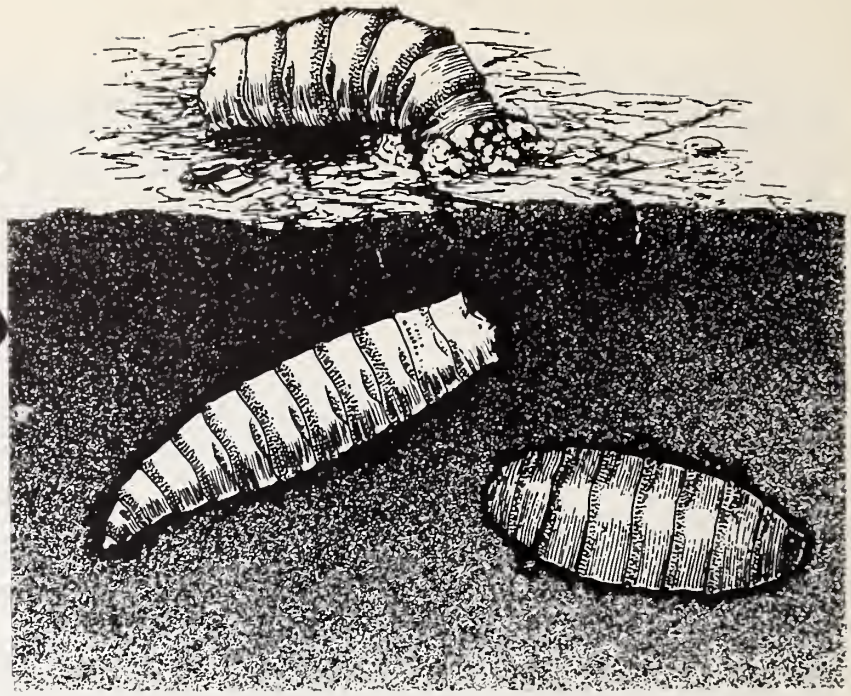

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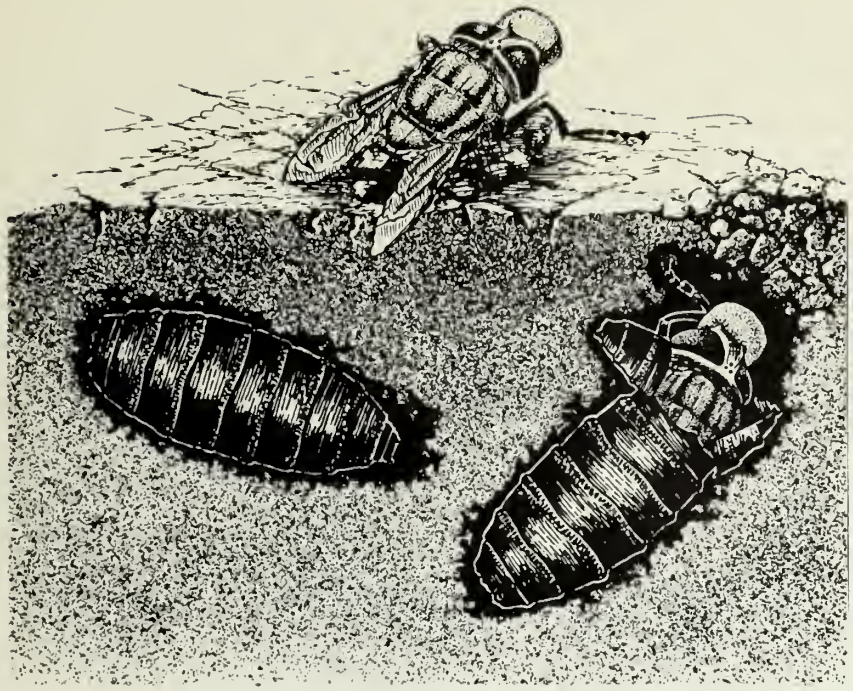
The time required for completion of the life cycle of the screwworm...from egg to larva, to fly...averages about 3 weeks. At 6 days of age, a female fly can lay about 250 eggs on a wound. Tiny, barely visible larvae hatch from

Facts About The Screwworm

Screwworms attack all warmblooded animals. Losses may occur as a result of death, or from crippling, weight losses, or increased susceptibility to diseases. Labor that must be provided for animal inspection and treatment, and money spent for materials for prevention or treatment of screwworm injury also represent losses to livestock producers. Game animals, as well as domestic livestock, suffer injury or death from screwworm infestations.

The female screwworm fly lays eggs in batches of about 250 along the edges of open wounds. Within hours the eggs hatch into tiny larvae or maggots that burrow deeply into the wound. At this stage, the larvae are barely visible and are almost impossible to detect in a fly or tick bite, even on close inspection. Only the posterior ends of larvae protrude. Larvae do not crawl over the wound. With their rasping mouthparts, they tear away at the wound and feed on the exudate for 5 to 6 days, growing to about one-half inch in length. An infested wound attracts additional female screwworm flies that lay eggs, and these multiple infestations usually cause death of the host animal, unless treated. Grown steers have been killed within 10 days.

When fully developed, larvae drop from the wound and burrow into the soil to form brown, tough-shelled pupae. After about a week, screwworm flies emerge from the pupal shells. The life cycle of the screwworm averages about 3 weeks, but can be as long as 65 days during cold weather.



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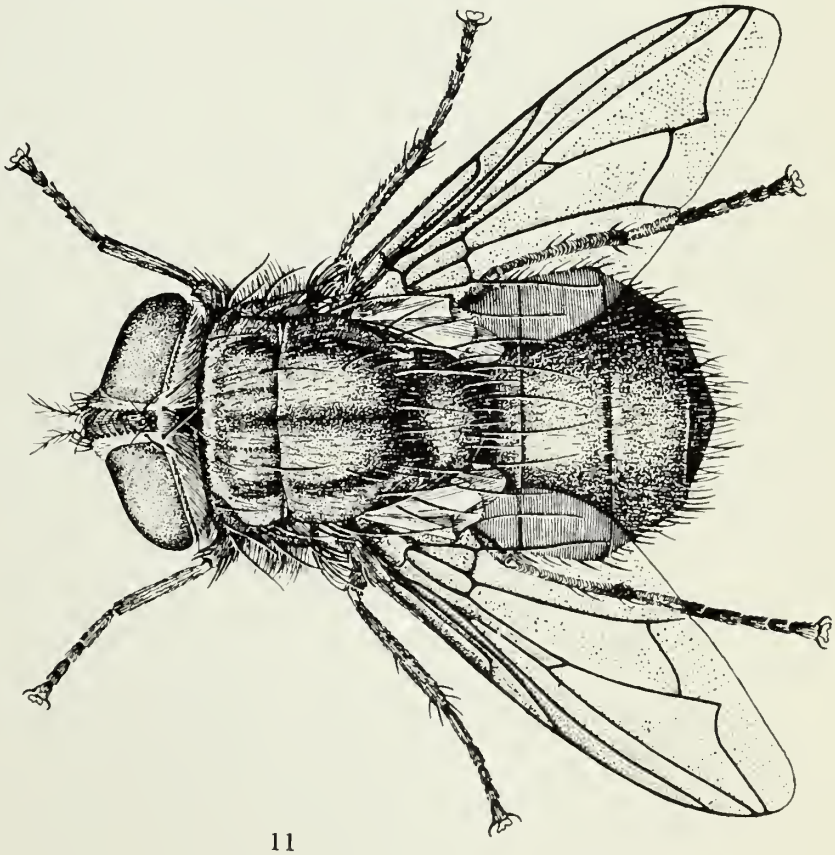
the eggs within a day, and feed on flesh for 5 to 6 days. They then drop to the ground and enter the soil where they are transformed into pupae encased in dark-colored, tough capsules. During warm weather, flies emerge from the pupal cases in about a week. The females mate within 2 days, and lay eggs 6 days later.



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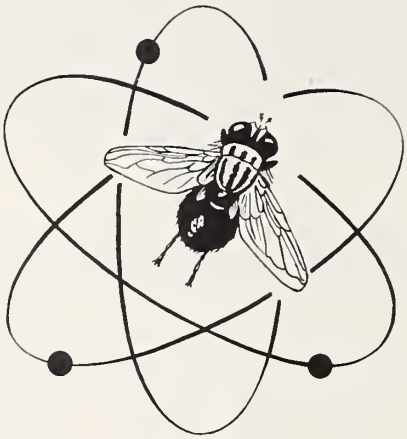
The screwworm fly, *Cochliomyia hominivorax*, is about twice the size of a housefly. It has a bluish-green body with three dark stripes along the back and an orange-colored head. It is difficult to distinguish from other blowflies.

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